Emerging Markets Review 55 (2023) 100962

Contents lists available at ScienceDirect

Emerging Markets Review

journal homepage: www.elsevier.com/locate/emr

The intention to use cryptocurrency: A meta-analysis of what we know

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ARTICLE INFO

JEL classification codes:
D91
E50
G41
O14
O16

Keywords:
Cryptocurrency
Bitcoin
Emerging markets
meta-analysis
UTAUT
Technology adoption

ABSTRACT

Cryptocurrency has gained in popularity in emerging markets, however the knowledge accumulation pertaining to factors contributing to intention to use cryptocurrency has been limited. To address this gap, we meta-analyzed 42 samples from multiple theoretical approaches. Seven common antecedents to intention to use cryptocurrency were assessed, as well as six moderators via meta-regression. A regression model to explain the intention to use cryptocurrency was calculated, and relative importance analysis determined the weight of each variable in predicting cryptocurrency use intention. The findings highlight factors influencing intention to use cryptocurrency in emerging markets and refine theoretical models for future research.

1. Introduction

Cryptocurrency has become an important part of the global economy and plays a potentially even larger role in numerous emerging markets (cf., Mellor, 2021; Vincent and Evans, 2019). Despite this rapid proliferation of cryptocurrency, the number of people who own and use it is still relatively low. While exact numbers are difficult to obtain due to the anonymous nature of cryptocurrencies, a recent estimate places the percentage of global ownership at about 4.2 in 2022 (Chainalysis, 2020). From other recent surveys, however, it is clear that usage rates around the world vary significantly with Vietnam (20.3%), South Africa (12.5%), Kenya (11.6%), and Nigeria (10.3%) being representative of a wider swatch of cryptocurrency's use penetration around the world (Triple, 2022). For comparison's sake, a recent Pew Research survey estimates that about 16% of United States (US) adults own cryptocurrency (Perrin, 2021). It is also clear that these numbers are changing rapidly.

The paper addresses an ongoing debate in global technology adoption and finance. The contribution of this paper is to fill the current research void in understanding the intention to use cryptocurrency. This will be accomplished through a meta-analysis and by identifying the strength of different factors associated with the intention to use cryptocurrency. Furthermore, the paper will provide analyses to examine whether the factors associated with the intention to use cryptocurrency vary depending upon a country's development status, as well as other situational factors, and the respective implications for emerging markets. With a clear understanding of both drivers and consistency of the relationships, the current research can be applied in the context of emerging markets to

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https://doi.org/10.1016/j.ememar.2022.100962
Received 31 December 2021; Received in revised form 12 July 2022; Accepted 6 September 2022
Available online 13 September 2022

aid financial development and inclusion.

Even though global use is increasing, the number of people who do not own any cryptocurrency vastly outnumber those who do. This relatively low proportion of users provides an opportunity for its growth in emerging markets. An increase in its use and ownership would have the potential to provide alternatives to local financial asset markets and to drive the pace of development in their broader financial systems. At a national level, some countries are actively pursuing cryptocurrency use in general, and Bitcoin more specifically, as a tool to assist the development of their economies (cf. Segal and Nechepurenko, 2021).

The recognition of Bitcoin by some countries does not suggest that all countries consider cryptocurrencies as beneficial to their development. For instance, the governments of China and India, the two most populous nations on earth, have taken steps to limit the use of cryptocurrencies in their countries (Salmon, 2021). While the wisdom of governmental participation in cryptocurrencies or individual ownership is a question for debate, and its ultimate success is not likely to be fully understood for some time, there is no debate that cryptocurrency has emerged as a new asset class and that regardless of government actions, the overall ownership and use of cryptocurrency has rapidly increase in recent years (Krückeberg and Scholz, 2019).

Cryptocurrency supporters assert that cryptocurrency holds promise to assist the development of emerging markets (Vincent and Evans, 2019). More specifically, the economies of emerging markets can make it difficult for citizens to store wealth unless it is done in US dollars or some other stable global currency. Further, fiat currency devaluation is a major concern with doing business in, and holding most currencies issued by nations from emerging economies. Potentially, and more importantly, access to cryptocurrencies can assist people in emerging economies by offering access to financial instruments that are generally only available to people in countries with more developed banking systems. These financial instruments include better access to credit, lower transaction fees, and other benefits which residents of countries with more developed banking systems take for granted. One area where cryptocurrencies can be specifically useful is in the remittance industry of emerging markets, making the process of remittance potentially more efficient.

With this burgeoning interest, understanding the conversion of non-users into users and maintaining those users once they begin, becomes a vital part of cryptocurrency's success. In particular, this rate of growth in its user base will determine whether cryptocurrency ultimately succeeds or whether, as many economists and financial advisors have warned, it will ultimately "go to zero" (e.g., Harris, 2018; Li, 2021; Locke, 2021).

Consistent with the potential uses for development, the overall rise in ownership and usage and the amount of general interest, significant research has been conducted to understand the intention to use cryptocurrency. Academic researchers around the world have been seeking answers to this issue, and this research has generally used a technology adoption focus, since, at its core, cryptocurrency is a financial technology (Arias-Oliva et al., 2019). Despite this growing body of extant research, however, no meta-analytic research has provided an integrative look at the factors that influence people's intention to use cryptocurrency. Thus, as described above, this paper addresses this deficit through meta-analyses and by examining the relative strength of factors associated with the intention to use cryptocurrency. To accomplish these goals, the next section of the paper includes the Literature Review, followed by Methods, Results, Discussion, and a Conclusion.

2. Literature review

2.1. Evolution of cryptocurrency

With the creation of his vault system in 1979 and the subsequent dissertation on the topic in 1982, David Chaum's research set in motion the modern concept of blockchains that have made cryptocurrency possible (Chaum, 1979; Chaum, 1982). While a few early attempts at creating cryptocurrencies were launched (e.g., DigiCash, Hashcash), none of these became widely used until Bitcoin was released to the public in 2009. Bitcoin was first described in 2008 in a white paper by Satoshi Nakamoto (though the identity of the author or authors who produced the original whitepaper have been the focus of considerable speculation).

The differences associated with individuals living in emerging economies versus those in developed economies, have been associated with two different reasons for holding cryptocurrency (or use cases). More specifically, in the emerging world, cryptocurrency is often viewed as a development tool that can help to provide transactions and as a hedge against unstable local currencies. In the developed world, however, cryptocurrencies are more often treated as a speculative asset class. These two cases are not mutually exclusive, and some people in emerging economies are certainly treating cryptocurrency as a speculative asset class while some people in developed economies are certainly treating cryptocurrency as a currency hedge or for some other reason. For either case, however, demand is important.

Consequently, the desire to understand cryptocurrency demand is straightforward. If a cryptocurrency has significant demand, it will enhance its value. This also applies to other related entities, such as exchanges that trade cryptocurrencies, the creators of the cryptocurrencies themselves, as well as the individuals who own cryptocurrency. Presently, Bitcoin and to a somewhat lesser degree Ethereum, have succeeded in creating demand, while most other cryptocurrencies have not been able to achieve widespread success. For a cryptocurrency to grow in value, it needs to attract a large user base, and retain them as well. As a result, a more solid understanding of a potential user's intention to use, or the ability to understand their purchase behavior can provide a clearer guide for building user demand.

2.2. Theoretical approaches to understanding adoption of technology

Even though research on cryptocurrency use is all relatively recent in absolute terms, researchers have used multiple theoretical approaches to explore cryptocurrency use. Many of these theoretical approaches, however, are conceptually linked to each other, with

most of the approaches initially being rooted in Fishbein's (1967) theory of reasoned action.

The theory of reasoned action (TRA) was initially proposed by Fishbein (1967) and further illustrated in Fishbein and Ajzen (1975) and Ajzen and Fishbein (1980), as a research method for determining behavioral intention based on two measures: attitude toward the behavior, and subjective norms. In this very parsimonious model, a person's attitude toward a behavior, product, or service, can be negative or positive. Subjective norms refer to peer pressure, or the acceptance or rejection of the behavior, product, or service in question. For example, in the decision to use a cryptocurrency, the opinion of her peers will have a positive or negative impact on that individual's decision (e.g., Gupta et al., 2020; Sheppard et al., 1988). The theory of reasoned action, or adapted variations of it, has been widely used to determine behavioral intention of individuals to use cryptocurrency. In fact, the theory of reasoned action can be considered the basis for most of the subsequently developed models to understand behavioral intentions and subsequent behaviors (Venkatesh et al., 2003).

The theory of planned behavior (Ajzen, 1991) or TPB, is an extension of the TRA. More specifically, TPB adds another predictor variable to the TRA framework: perceived behavioral control. The TPB posits three variables: attitude, subjective norms, and perceived behavioral control, are predictive of future behavioral patterns of respondents. In the TPB, perceived behavioral control refers to the degree to which an individual feels capable of being able to perform a behavior, or use a certain product or service. In other words, if people believe they have more resources and opportunities to perform a certain behavior, then they will likely have higher behavioral control over performing that behavior (Madden et al., 1992). Perceived behavioral control reflects both an individual's subjective evaluation of capabilities, as well as any personal experience with the product or service (Ajzen, 1991; Ajzen, 2020).

Further building on the TRA and the TPB is Davis' (1989) technology acceptance model (TAM). The TAM has been used to determine the behavioral intentions of individuals to use cryptocurrency (e.g., Albayati et al., 2020). In the TAM, the beliefs about a product or technology that is being adopted are investigated via two measures, perceived ease of use (PEOU) and perceived usefulness (PU). In the TAM, these two measures have a meaningful impact on the consumer's attitude toward the new product or technology (Davis, 1989). Further, Davis and his colleagues (Davis et al., 1989) posit that attitude and perceived usefulness both affect the behavioral intention of a user, which then is predictive of the user's adoption of the new technology. It differs from the original constructs of the TRA by eliminating subjective norms, instead adding the two measures PEOU and PU to measure the user's beliefs about a technology or product, or mobile or web application.

Beyond the TAM, other models continue to build on the fundamental structure laid out in the theory of reasoned action, such as the decomposed theory of planned behavior (DTPB), a combined model of TAM and TPB (c-TAM-TPB), the model of PC utilization (MPCU), the innovation diffusion theory (IDT), and social cognitive theory (SCT), to name a few (Dwivedi et al., 2019).

An important example of this incremental building process is the unified theory of acceptance and use (UTAUT). The UTAUT, in its original or adapted form, has also seen frequent use to determine user's involvement with cryptocurrency (e.g., Alazab et al., 2021; Al-Amri et al., 2019; Cousins et al., 2019; Gupta et al., 2020). The UTAUT builds upon the TRA, the TPB, and the TAM, but Venkatesh et al. (2003) posit that attitude toward the behavior, and self-efficacy, as theorized in TRA and TPB, are non-determinants of future use, and thus are not included in the UTAUT. The UTAUT includes performance expectancy, effort expectancy, social influence, and facilitating conditions as its four predictor variables that predict behavioral intention of users to engage with a new technology (Venkatesh et al., 2003). Furthermore, behavioral intentions and facilitating conditions serve as predictors of actual use of a technology. Performance expectancy refers to the degree to which a user believes that using a new technology will improve her performance at the workplace. Effort expectancy refers to her belief about the ease of use of the new system or technology. Social influence refers to the acceptance or rejection of the technology, or product, or service among the user's peers (friends, family, etc.) or groups that influence the user. Venkatesh et al. (2003) clarify that social influence is the same construct that is classified as subjective norms in the TRA. Facilitating conditions, on the other hand, were positioned to be similar to perceived behavioral control used in TPB, but the facilitating conditions refer to the degree to which the user believes that there are support systems in place to help adopt the new technology, and perceived behavior control is a much narrower concept.

A similar model to the UTAUT is UTAUT2. The UTAUT2 adds three new predictor variables to the existing four of UTAUT (Venkatesh et al., 2012). A key difference is that UTAUT2 was specifically developed as a model of predicting *consumer* adoption of a new technology, rather than *employee* adoption of a new workplace system. The three new variables in UTAUT2 are hedonic motivation, price value, and habit. Hedonic motivation refers to the enjoyment that a consumer derives from using a new technology, whereas price value refers to the functional value users believe they are deriving from adopting a new technology. Habit refers to the extent of a user's experiences with a technology or similar technologies and the degree to which the user believes the skills needed to operate the new technology to be habitual or previously learned. The UTAUT2 model and its variations have also been utilized in recent studies related to cryptocurrencies (e.g., Queiroz and Wamba, 2019; Alkhowaiter, 2020).

In many instances, studies examining cryptocurrency usage augment the aforementioned theoretical models, by adding predictor variables, renaming, and clarifying some variables, and in some instances using some but not all of the predictor or outcome variables. In other words, many studies have started with a foundational approach, and have then extended that approach in some way to explore some distinct antecedents to a person's intention to use cryptocurrencies.

3. Methods

3.1. Literature search and criteria for inclusion

This study follows the meta-analysis guidelines provided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Liberati et al., 2009). Consistent with most meta-analyses (cf. Cram et al., 2019; Liu et al., 2019), the current

study consisted of four fundamental processes. More specifically, steps in the current study included: (a) the search for relevant individual studies in the extant literature; (b) defining the inclusion criteria; (c) coding the identified studies; and (d) meta-analyzing the identified studies to provide accumulated findings. Each of the steps is explained in detail below and are also illustrated in Fig. 1.

3.2. Literature search

The literature searches for this study were conducted through November 12, 2021. We began with an examination of the ABI Inform Global, ProQuest, and ProQuest Dissertations databases for publications using the terms "cryptocurrency", "Bitcoin", "Ethereum", or "Dogecoin". Trial attempts were made using other cryptocurrencies (e.g., Cardano, Polka Dot, etc.), but no papers could be located that were not already found using the four search terms we began with, so we reverted to the original search terms. We then combined these search terms with the results of a second search using the terms "intention to use", "intention to participate", "theory of reasoned action", "theory of planned behavior", "UTAUT", or "UTAUT2". These databases are frequently used as they are broad and cover most of the primary outlets relevant to studies of cryptocurrency use intentions. A total of 113 manuscripts were identified through this search with 100 (88.5%) being journal articles, eight (7.1%) being dissertations or theses, and the remaining five (4.4%) being conference proceedings or other similar outlets.

Previous research suggests that journal publications are biased toward higher effect sizes and hypothesis-supporting results, but the likelihood for results can be minimized by including a wider set of primary studies (Rosenthal, 1979; Templier and Paré, 2015). Consequently, we used Google Scholar which captures a wide variety of conference proceedings, dissertations, and other works from journals (especially research published in emerging markets) that are often not indexed in the larger electronic databases. The Google Scholar search used the same content search terms as the search described earlier (i.e., "cryptocurrency", "Bitcoin", "Ethereum", or "Dogecoin") but were not limited by the second set of search terms. This was to be as broad as possible. In addition to the 113 manuscripts identified in the first step, an initial screen of the Google Scholar results identified 63 additional manuscripts (including

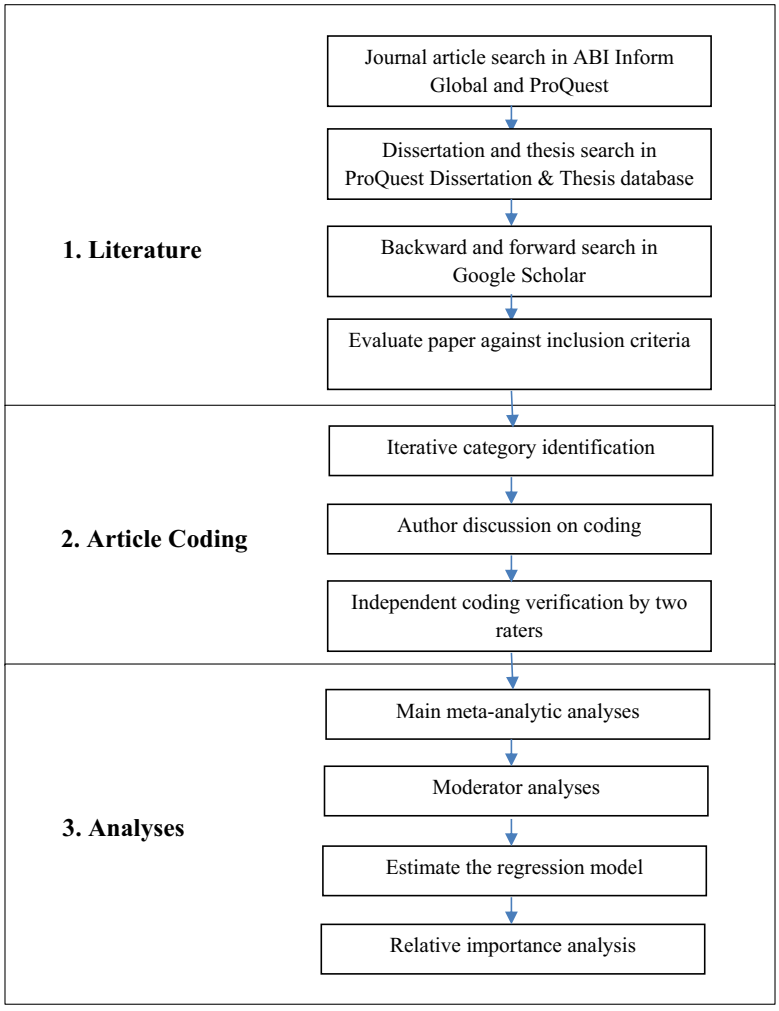

Fig. 1. Methodological activities.

seven theses or dissertations) which appeared to be potentially usable for our analysis based on their abstracts.

From the two searches described above, we created a pool of 176 manuscripts to examine. While no method can ensure that every possible primary study was identified, any omissions were likely random and would not significantly influence the subsequent results.

3.3. Inclusion criteria

Articles were included when they met the following criteria. First, articles needed to be quantitative studies at the user or individual unit of analysis that considered using cryptocurrency. As a result, conceptual papers, reviews, qualitative studies, and empirical studies focusing on the acceptance of cryptocurrencies by vendors were excluded. Similarly, studies on cryptocurrency mining were also omitted. In addition, empirical studies that focused on legal, political, or regulatory policies were also excluded from any further analyses.

As a second criteria, papers were required to include the intention to use as a dependent variable. The intention to use included both *new* (or initial use), as well as *ongoing* or *continuing* use (often referred to as loyalty or as repurchase intentions). This approach is consistent with other meta-analyses using the intention to use as a criterion measure (e.g., Cram et al., 2019; Liu et al., 2019). This approach is based on the idea that intentions are associated with subsequent usage and that these measures are more under the control of the individual subject compared to ultimate usage behavior.

Third, manuscripts had to include data sufficient to calculate an effect size statistic (i.e., correlation coefficient) for at least one relationship that would be examined in the subsequent analyses. This excluded many papers that only included multivariate results (usually from regression models or structural equation models). This criterion excluded manuscripts that were published papers, dissertations, and conference papers, as the reporting of correlations is clearly not required by many journals, conference reviewers, or examination committees.

A total of 42 manuscripts with 42 independent samples met the inclusion criteria. Of the 42 samples used for the meta-analyses, there were 25 from journal articles, ten from dissertations or theses, five from conference proceedings (Refer to Appendix A for a list of the included papers), and two from other sources. The total population from these 42 samples was 9482 meaning that the average sample consisted of a little over 225 people. In all 42 samples, the data collection employed a self-reported survey format.

The volume of studies is consistent with numerous past meta-analyses in information systems, marketing, and financial journals. For example, Lee and Xia (2006) included 21 studies, Sharma and Yetton (2003) used 22 studies, (Cugelman et al., 2011) had 29 studies, Taiwo and Downe (2013) used 37 studies, and Knoll and Matthes (2017) analyzed 46 studies. A further breakdown of the articles used in our analyses is shown in Table 1.

3.4. Article coding

Each sample was first coded by the first author for the types of correlates, sample characteristics, and whether the correlations provided were between latent or observed variables (i.e., whether the relationship would need to be corrected for scale reliability). After this initial coding was completed, a second author independently completed the same coding. The agreement was over 96% and the few cases where coding differed were resolved through a discussion between the two raters. The sample size of each empirical study was recorded as the number of observations used to compute the correlation coefficient.

Due to the varying theoretical frameworks used in the literature, we used an inclusive approach to allow for the most complete analysis. We began by iteratively placing the independent variables in categories where a common theme existed. Once the categories were identified, we sought to aggregate similar categories into more broadly recognized ones. To do this, we utilized the UTAUT2 framework because it was developed to incorporate the other models most used to study technology usage.

In most cases, we were able to simply categorize the variables from the primary studies into one of the distinct antecedent variables included in the UTAUT2 approach. There was, however, an important exception to this relatively straightforward process. The UTAUT2 does not have an explicit category for perceived behavioral control, but rather folds it into the broader concept of facilitating conditions. Because the extant literature contained numerous studies including perceived behavioral control, we decided to leave it as a distinct antecedent rather than combining it with the less specific “facilitating conditions” category.

For our final analyses, we included seven distinct antecedents. The list of antecedents used can be seen in Table 2.

3.5. Meta-analysis procedures

A separate meta-analysis was performed for each of the seven independent variable categories listed in Table 2. We used the meta-analytic procedures developed and recommended by Hunter and Schmidt (2004) to calculate the population correlations between intentions to use cryptocurrency and the related variables. The meta-analytic technique developed by Hunter and Schmidt is widely

Table 1
Paper collection results.

	Journal Articles	Conference Proceedings	Dissertations and Theses	Other Sources
Papers identified in searches	124	32	15	5
Papers excluded due to scope criteria	99	27	5	3
Total Included Papers	25	5	10	2

Table 2
Variables included in the meta-analysis.

Intention to Use: The degree to which a person has formulated conscious plans regarding whether to perform a specified future behavior.
Social Influence: The degree to which an individual perceives that important others believe he or she should use the new system. Social influence as a direct determinant of behavioral intention is represented as a subjective norm.
Attitude toward the Behavior: The psychological emotion and the positive or negative evaluation that are caused as an individual engages in a certain behavior (Fishbein and Ajzen, 1975).
Perceived Behavioral Control: The perception of the difficulty of enacting a behavior. (Ajzen, 1991). Perceived behavioral control consists of two highly related (and correlated) variables: perceived self-efficacy (one's belief about their own ability (Bandura, 2010) and perceived controllability (the belief that one's behavior is volitional (Ajzen, 2002)).
Performance Expectancy: The degree to which an individual believes that using the system will help him or her to attain gains in job performance. Perceived usefulness from the technology acceptance model also represents this concept.
Effort Expectancy: The degree of ease associated with the use of a system. Perceived ease of use from the technology acceptance model as well as complexity also capture this same concept.
Facilitating Conditions: The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. This definition captures concepts embodied by the related concepts of compatibility and perceived behavioral control (from the theory of planned behavior).
Price Value: The cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them (Venkatesh et al., 2012, p. 161)

used and is appropriate given the type of data reported in the primary literature (Harter et al., 2020). The specific program used was Meta-Essentials (Suurmond et al., 2017).

To provide the most accurate estimates, the weighted mean correlations and their variances were corrected for both measurement and sampling error. We did not attempt to correct for restriction of range due to the lack of a known distribution range and as a result, our reported values are conservative. Further, since the data from each of the 42 samples was collected using virtually identical procedures (i.e., surveys), each study was weighted only by its sample size and not by any characteristic of the publication outlet where the sample appeared.

For each meta-analytic estimate, multiple values are reported: (1) the number of studies on which the estimate was based (k), (2) the sample size on which the estimate was based (N), (3) the sample-size weighted mean corrected correlation (ρ), (4) the mean corrected correlation's standard deviation (SD r), (5) Hedges and Olkin's (2014) Q-statistic to assess heterogeneity, (6) the I^2 index, (7) the 95% confidence interval associated with the mean corrected correlation (ρ), and (8) Rosenthal's fail-safe N which provides the robustness of the corrected correlation by reporting the number of studies with a correlation of zero would need to be added to the analysis before the result was not statistically significant. Of these values, three values (i.e., large Q-values, wide confidence intervals, and high I^2 values) suggest the potential presence of moderators or heterogeneity in the overall corrected correlation.

3.6. Moderators

For our moderator analyses, we took a two-step approach. First, we tested whether there were meaningful differences in the relationships based on the economic development stage of the country in which the study was collected. This initial test was to determine whether the variables assessed had different relationships in emerging economies than in developed ones. By including all samples, and not just those conducted in emerging economies, more robust tests can be conducted due to the increased statistical power and great variance in the independent measures. The second step of this process used the results of the first step and then sought to examine whether we could identify significant variation in the pattern of results. To identify potential moderators, we relied on theory and previously published work in this area. As a result of this analysis, we focused on six moderators for our meta-analysis. Appendix A provides detailed coding of moderators for each of the included studies.

The first two moderators were examined as part of step 1. In other words, we used the country's innovation level and the country's banking system access and depth (operationalized by ATMs, bank accounts, and credit cards) as measures of economic development. We then analyzed two other measures (i.e., user type and cryptocurrency type) to determine whether those factors accounted for significant variance in the relationships studied.

3.6.1. The moderating role of country innovation level

We operationalized the innovation level of a country using the measure provided by the World Intellectual Property Organization (WIPO) called the Global Innovation Index (GII) (WIPO, 2020). The GII consists of two sub-indices, the Innovation Input Sub-Index, and the Innovation Output Sub-Index. The Innovation Input Sub-Index includes five measures: institutions, human capital and research, infrastructure, market sophistication, and business sophistication while the Innovation Output Sub-index is based on the results of innovative activities within an economy and includes knowledge and technology outputs and creative outputs (WIPO, 2020). Based on the multitude of measures used to quantify the GII, we can presume that people residing in countries with higher GII scores, are surrounded with favorable conditions making their engagement and purchase of innovative technologies, like cryptocurrency, more possible.

3.6.2. The moderating role of Country's banking systems access and depth

As part of determining whether a country's economic development level influenced the results, we include three additional moderators which may influence the relationship between the antecedents and the intention to use cryptocurrency. These three measures represent the access and depth of the country's traditional banking system. Based on the data obtained from the World Bank

(The World Bank - Indicators, 2022), we included the number of automatic teller machines (ATMs) per 100,000 adults, percentage of the population with a bank account, and percentage of people who have a credit card. These moderators evaluate structural differences of emerging versus developed markets in terms of their traditional financial systems.

3.6.3. The moderating role of user type

If a cryptocurrency is to be successful, it requires a large user base. A large user base will generally require that two simultaneous groups of users are involved: first, there are new users of the technology and second, the continuing users stay engaged. In the technology adoption literature, this is sometimes referred to as previous experience with the technology, but in other cases it is framed as a different purchase decision (i.e., initial versus continuing purchases or customer loyalty). For the current study, the user type is coded to determine whether new potential users weigh decision criteria differently from those individuals who are already owners of cryptocurrency, as this may have important ramifications for ultimately increasing the user base of any cryptocurrency. Thus, we examine whether the individuals in a sample are new users, ongoing users, or a mix of both user types.

3.6.4. The moderating role of the type of cryptocurrency used (bitcoin vs. others)

Since 2009, Bitcoin has been the leading cryptocurrency due to its network effect and its security. Gandal and Halaburda (2014) suggest that as Bitcoin becomes more valuable against the US dollar, it also becomes more valuable against other cryptocurrencies. The authors also suggest that Bitcoin popularized the use of cryptocurrencies as financial assets (Gandal and Halaburda, 2014). Since the launch of Bitcoin, however, there have been literally thousands of cryptocurrencies introduced. As a result of this proliferation, we sought to determine whether the relationships of interest were influenced by the "brand" of cryptocurrency. As a result, we compared studies using Bitcoin versus studies using a general analysis of generic, or "unbranded" cryptocurrency references. It should be pointed out that none of the primary samples in our analyses specifically focused on a specific cryptocurrency, other than Bitcoin.

3.7. Moderator analyses

To assess the heterogeneity of the overall relationships, we used a combination of Hedges and Olkin's Q test and the I^2 index consistent with other research (e.g., Jadil et al., 2021; Šumak et al., 2011). Using this approach, moderators are indicated by a significant Q test and an I^2 index of more than 75% (cf. Jadil et al., 2021; Santini et al., 2019). If a relationship has high heterogeneity, this suggests the potential presence of moderators.

Once a relationship was identified as having potential moderators, we then examined six different potential moderators to assess whether any or all of them helped to explain this underlying variance. To test whether the moderator was significant, we used meta-regression consistent with the recommendations of Steel and colleagues (Steel et al., 2021). The results of these analyses are presented in the next section.

4. Results

The results associated with each of the seven variables identified in the theoretical review and their correlations with intention to use cryptocurrency are provided in Table 3.

For significance, a z-test was conducted to evaluate the significance of each relationship's effect size. At $p < .001$, all of the variables in Table 3 were found to have a statistically significant relationship with intention to use cryptocurrency. Two homogeneity tests were also conducted for each of the eight meta-analyses reported in Table 3. The calculated-Q is greater than the critical-Q value for all seven relationships. Further, the I^2 index for all relationships exceeded 75%. As a result, the null hypothesis of homogeneity is rejected and the variability across effect sizes exceeds what is expected based on sampling error (Lipsey and Wilson, 2001). Thus, in all seven cases it was appropriate to test for potential moderators.

4.1. Moderator analysis

A total of 42 (i.e., 7 variables x 6 potential moderators) distinct moderator tests were conducted that examined the relationship between intention to use and the other variables in this study. Consistent with the recommendations of Steel et al. (2021), we used meta-regression analyses. It should be pointed out, however, that due to the relatively low number of studies in our analysis, separate

Table 3
Meta-Analysis Results for Intention to Use Cryptocurrency.

Variable	K	N	ρ	SE_ρ	Q	I^2	95% CI Lower	95% CI Upper	Fail- safe N
Attitude toward Behavior	15	3633	0.67	0.10	466.92	97.00%	0.53	0.77	12,240
Performance Expectancy	29	6795	0.63	0.06	765.98	96.34%	0.55	0.70	38,792
Price Value	13	2825	0.57	0.05	110.25	89.12%	0.49	0.64	4913
Effort Expectancy	27	6315	0.55	0.04	362.09	92.82%	0.48	0.61	21,887
Social Influence	24	5523	0.54	0.06	396.88	94.20%	0.46	0.62	17,481
Facilitating Conditions	21	4754	0.54	0.05	243.23	91.78%	0.46	0.61	12,725
Perceived Behavioral Control	11	2820	0.48	0.09	277.63	96.40%	0.30	0.62	2552

Notes: CI = Confidence Interval; All ρs and Qs $p < .001$.

meta-regressions were run for each moderator rather than trying to simultaneously examine all five moderators as this would have violated sample size requirements (cf. Baldwin and Shadish, 2011). The results of these analyses are shown in Table 4.

4.2. Regression model

While the effect sizes shown in Tables 3 and 4 offer important indicators about the relationship between a series of antecedent variables and intention to use, they do not provide for a simultaneous analysis of these factors. To remedy this issue, we constructed a full meta-analytic correlation matrix by conducting distinct meta-analyses for the relationships between intention to use cryptocurrency and the seven antecedent variables included in Table 2 and Table 3. For this matrix, we started with the correlations from Table 3 and then conducted the 21 meta-analyses that were needed to construct a full correlation matrix. In conducting these 21 additional meta-analyses, we followed the same analytic procedures. The results showing these additional required meta-analyses are shown in Table 5.

An examination of the correlation matrix values in Table 5 showed that there were no empty cells. This means that at least one correlation existed for every relationship we analyzed and that we did not need to estimate any relationships from outside of the existing analyses as is often done in studies using similar methods where a large number of variables and their intercorrelations are being examined (Viswesvaran and Ones, 1995; Cram et al., 2019). To estimate a sample size for our correlation matrix, we calculated the harmonic mean consistent with the recommendation of Viswesvaran and Ones (1995). The harmonic mean was 2506.

Using the values from Tables 3 and 5, we conducted a regression model. The regression model examined the simultaneous relationships between the seven antecedent variables and intention to use cryptocurrency. The results of the structural model are

Table 4
Meta Regression Results for Moderator Analyses.

Variable	Moderator	b	SE	B	Z	R^2
Attitude toward behavior	Innovation Level	0.17	0.07	0.14	2.35*	0.019
	ATMs	−0.67	0.11	−0.32	5.97***	0.103
	Bank Accounts	0.38	0.15	0.15	2.60**	0.023
	Credit Cards	0.22	0.11	0.12	2.09*	0.015
	Use Type	−0.02	0.03	−0.04	−0.76	0.001
	Cryptocurrency Type	−0.26	0.03	−0.34	−7.322***	0.115
Performance Expectancy	Innovation Level	0.15	0.05	0.10	2.76**	0.010
	ATMs	0.03	0.06	0.02	0.43	0.000
	Bank Accounts	0.01	0.08	0.01	0.18	0.000
	Credit Cards	−0.12	0.06	−0.07	−1.95	0.005
	Use Type	−0.11	0.02	−0.21	−5.70***	0.043
	Cryptocurrency Type	−0.33	0.02	−0.49	−13.47***	0.237
Price Value	Innovation Level	0.41	0.08	0.49	5.11***	0.237
	ATMs	−0.69	0.19	−0.65	3.58***	0.421
	Bank Accounts	−0.34	0.17	−0.19	−2.01*	0.037
	Credit Cards	−0.58	0.09	−0.60	−6.35***	0.366
	Use Type	0.13	0.05	0.26	2.78**	0.070
	Cryptocurrency Type	−0.16	0.04	−0.41	−4.32***	0.170
Effort Expectancy	Innovation Level	0.42	0.05	0.41	7.63***	0.165
	ATMs	−0.45	0.07	−0.39	−6.66***	0.155
	Bank Accounts	−0.24	0.08	−0.16	−3.01	0.026
	Credit Cards	−0.37	0.06	−0.31	−5.78***	0.095
	Use Type	0.02	0.02	0.04	0.074	0.002
	Cryptocurrency Type	−0.23	0.03	−0.47	−8.88***	0.218
Social Influence	Innovation Level	0.34	0.05	0.31	6.17***	0.096
	ATMs	0.01	0.07	0.01	0.13	0.000
	Bank Accounts	0.15	0.08	0.10	1.97*	0.010
	Credit Cards	−0.02	0.06	−0.02	−0.46	0.001
	Use Type	0.12	0.02	0.28	5.58***	0.079
	Cryptocurrency Type	−0.22	0.03	−0.41	−8.16***	0.167
Facilitating Conditions	Innovation Level	−0.07	0.06	−0.08	−1.27	0.007
	ATMs	0.09	0.07	0.08	1.22	0.007
	Bank Accounts	−0.26	0.08	−0.20	−3.09**	0.040
	Credit Cards	−0.18	0.08	−0.15	−2.26	0.021
	Use Type	0.07	0.02	0.21	3.35**	0.046
	Cryptocurrency Type	0.03	0.03	0.06	0.93	0.004
Perceived Behavioral Control	Innovation Level	0.98	0.10	0.57	9.51***	0.326
	ATMs	−0.71	0.12	−0.40	−6.14	0.157
	Bank Accounts	0.01	0.22	0.00	0.04	0.000
	Credit Cards	−0.37	0.09	−0.25	−4.24***	0.065
	Use Type	0.04	0.04	0.05	0.90	0.003
	Cryptocurrency Type	−0.38	0.04	−0.60	−10.04***	0.363

Note: Cryptocurrency type was coded generic = 0, Bitcoin = 1. Use type was coded new = 0, both = 1, and ongoing = 2. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Table 5
Intercorrelations for the Full Correlation Matrix.

Variable	K	N	ρ	Q	95% CI Lower	95% CI Upper	Fail- safe N
Social Influence							
Attitude	11	2637	0.55	127.18***	0.42	0.65	3992
Perceived Behavioral Control	10	2865	0.45	330.72***	0.22	0.63	2347
Performance Expectancy	18	4082	0.58	309.31***	0.47	0.66	11,280
Effort Expectancy	14	3130	0.45	251.96***	0.32	0.57	3967
Facilitating Conditions	18	4209	0.52	518.02***	0.40	0.62	8588
Price Value	9	2088	0.41	115.19***	0.26	0.55	1473
Attitude							
Perceived Behavioral Control	6	1506	0.54	56.78***	0.39	0.67	1156
Performance Expectancy	12	2851	0.64	435.18***	0.46	0.76	7292
Effort Expectancy	13	2921	0.54	158.36***	0.41	0.64	4720
Facilitating Conditions	6	1532	0.46	160.84***	0.14	0.69	756
Price Value	8	1720	0.57	51.99***	0.47	0.66	2054
Perceived Behavioral Control							
Performance Expectancy	18	3778	0.41	252.20***	0.30	0.50	3764
Effort Expectancy	3	2129	0.40	51.05***	0.31	0.49	2129
Facilitating Conditions	7	1814	0.37	186.00***	0.12	0.58	684
Price Value	7	1629	0.42	81.24***	0.25	.0.56	654
Performance Expectancy							
Effort Expectancy	25	5843	0.54	395.21***	0.46	0.61	18,239
Facilitating Conditions	17	4176	0.53	271.61***	0.44	0.62	8112
Price Value	12	2763	0.51	76.83***	0.42	0.59	3772
Effort Expectancy							
Facilitating Conditions	14	3322	0.59	473.16***	0.42	0.72	6525
Price Value	14	3088	0.51	131.70***	0.41	0.59	4345
Facilitating Conditions							
Price Value	8	1947	0.39	212.79***	0.15	0.59	819

Note: * = p < .05, ** = p < .01, *** = p < .001.

reported in Table 6.

4.3. Relative importance analysis

The results in Table 3 show each variable's correlation with the intention to use cryptocurrency. Table 6 provides the standardized regression weights for the simultaneous examination of the antecedents. It should be pointed out, however, that each of these analyses only provide the relationships of specific variables and are unable to provide for the relative importance of each variable (Cram et al., 2019; Johnson and LeBreton, 2004). To measure the relative contribution of each variable, a relative importance analysis is needed in which the intercorrelations among the variables are accounted for. Accounting for these intercorrelations is necessary for the cryptocurrency use literature, because as typical with studies employing models based on any of the technology adoption models, there are relatively large correlations among the antecedent variables as evidenced by Table 5. Relative importance analysis addresses this condition as it provides estimates of the unique variance explained by each variable after accounting for the relationships between the variables (Johnson, 2000). To compute the relative importance of each of our antecedent categories, we used Tonidandel and LeBreton's (2015) RWA-Web program. The results of this analysis are presented in Table 7.

5. Discussion

This research sought to better understand the antecedents to cryptocurrency use intention by conducting a review of multiple

Table 6
Regression Results Predicting Intention to Use Cryptocurrency.

Antecedent	Model 1
	Beta Weights
Attitude	0.273***
Price Value	0.168***
Performance Expectancy	0.181***
Social Influence	0.077***
Facilitating Conditions	0.145***
Effort Expectancy	0.071**
Perceived Behavioral Control	0.071***
Total Variance Explained	0.586

Note: * = p < .05, ** = p < .01, *** = p < .001.

technology acceptance approaches, and then meta-analyzing 42 studies that contained 390 distinct relationships of interest. These results were calculated using a combination of meta-analysis, linear regression, and relative importance analysis. In addition, we also explored whether there were meaningful moderator effects of these relationships by identifying and using meta-regression to evaluate six theoretically grounded moderators.

5.1. Direct and moderating effects

The initial assessment of the antecedents' relationships to intention to use cryptocurrency suggested that the effect sizes associated with each of the antecedents were remarkably similar to each other. More specifically, a simple average of the seven effect sizes was about 0.57. The range of these relationships was 0.48 to 0.67. Thus, the simple meta-analyses conducted between the identified antecedents and intention to use cryptocurrency supported that the magnitude of these relationships was strong and relatively consistent suggesting that all seven are important.

In terms of whether there were meaningful differences in the relationships based upon the degree of economic development, statistically significant moderation existed in 17 of 28 tests conducted, but the average magnitude of these effects was weak. More specifically, in only three of the 28 cases did the variance explained exceed 25%, while the average variance explained was only 8.6%. For a reference point, Hunter and Schmidt (2004) consider 75% as the threshold for significant moderation to occur. As a result, it is safe to consider the overall results of this study as being consistent for emerging and developed economies. This provided the first step of the study's analysis and allows for more specific analyses to be conducted across a collection of differing study characteristics.

When study characteristics (user type and cryptocurrency type) were examined, the relationships between the antecedents and the intention were also found to be moderated in many cases (10 of 14), although most of these effects were also relatively weak. When considered in terms of their explanatory power, in only one of 14 cases did the study characteristic moderating variable explain at least 25% of the variation in the observed relationships, and the average variance explained was 10.8%.

Thus, while there are moderating effects that deserve further attention, at this time it does not appear that many of the moderating effects are of magnitudes that would alter practice. It is also important to point out that in cases, the "form" of the moderators was the same, meaning that relationships that were positive remained positive in all cases.

While the main effects reported in Table 3 suggested broadly similar effect sizes, a series of follow up analyses, however, painted a more nuanced picture. First, a regression model (see Table 6) found widely discrepant path coefficients that rendered a picture of certain variables (i.e., attitudes toward the behavior, performance expectancy, price value, and facilitating conditions) playing a much more influential role than others (i.e., social influence, effort expectancy, and perceived behavioral control).

The relative importance analysis in Table 7 reinforced the relative differences in the contributions of the measures. More specifically, three of the four variables identified in the regression model appear to account for the bulk of the variance in the intention to use cryptocurrency. Thus, attitudes toward the behavior, performance expectancy, price value appear to be the most important factors that contribute to explaining whether an individual will use cryptocurrency, and account for 55% of the variance in the intention to use cryptocurrency.

These empirical results all bring us back to the primary focus of the current research project. More specifically, we set out to understand the strength of different factors associated with intention to use cryptocurrency. Further, we want to provide analysis of the consistency of these findings to determine whether the process differed across economic development or study characteristic factors. The results of our analyses suggest that attitude toward the behavior, performance expectancy, and price value are key to leveraging an individual's intention to use cryptocurrency and that these factors are still extremely relevant given the different environments and situations we assessed. The combination of these findings provides significant integration for a subject (i.e., cryptocurrency usage) that has been largely disjointed until now.

5.2. Theoretical contributions

To our knowledge, this is the first meta-analysis undertaken to integrate the findings of currently available studies of the intention to use cryptocurrency. Our study provides an integrative insight into the available literature, as it provides a unifying theme of the seven antecedents used in our model working together cohesively to explain the variance in intention of using cryptocurrency. Not only does our study synthesize the currently available literature on cryptocurrency, but it also provides a more important insight into the individual relative weight of each antecedent to explain cryptocurrency usage intention. We further dissect the relationships established in our model, using the lens of multiple moderators. This process further refined the scope of our study generating interesting results for future work in the area. Our model is quite robust, explaining almost 60% of the variance in cryptocurrency usage intention (as seen in Table 6). This particular model that we have used incorporating seven antecedents filtered through various theories surrounding behavioral intention (e.g., TRA, TPB), and specifically technology use and acceptance models (e.g., TAM, UTAUT, UTAUT2) can be a useful tool for future research in this space.

5.3. Practical implications

Our findings have important implications for the intention to use cryptocurrency. Even though all seven antecedents used in our study explain variance in the intention to use cryptocurrency, just three constructs have almost the same explanatory power as all seven (55% versus 60%. Furthermore, the six moderators used to address the differences among countries had nominal influence on the relationship between the seven antecedents and intention to use. As a result, our findings indicate that intention to use

Table 7
Relative Importance Analysis for Antecedents of Intention to Use.

Antecedent	Raw Relative Weight	Relative Weight as a % of R^2
Attitude	0.129	22.00%
Price Value	0.092	15.63%
Performance Expectancy	0.104	17.72%
Social Influence	0.066	11.25%
Facilitating Conditions	0.074	12.70%
Effort Expectancy	0.067	11.38%
Perceived Behavioral Control	0.055	9.32%
R^2	0.586	

Note: Raw relative weights add up to R^2 and raw weights as a % of R^2 add to 100%.

cryptocurrency is both straightforward and universal (at least across the moderators we analyzed).

For stakeholders interested in promoting cryptocurrency, our findings indicate that they should focus on the attitude toward the behavior, performance expectancy, and price value. For example, businesses and governmental entities trying to increase the user rate of cryptocurrencies can be effective in altering user attitudes by potentially educating them how cryptocurrencies work, improving access, and emphasizing the positive personal experiences associated with cryptocurrency use.

Performance expectancy is the second most influential factor. To enhance performance expectancy, the message that cryptocurrency use can accomplish the intended goals of the user is key. One specific way to achieve this is for the speed of transactions to be improved. This, however, is presently a major limitation of most cryptocurrencies. More specifically, as of the writing of this paper, Bitcoin can complete between four and seven transactions per second, and this is written into its core programming. For some scale as to how slow Bitcoin transactions really are, Visa processes about 1700 transactions per second. This points to a major scaling issue facing many cryptocurrencies and convincing people of the general utility of cryptocurrencies may be more difficult if this scaling issue cannot be addressed.

The third factor, price value, suggests that the intent to use cryptocurrency is strongly determined by how the user perceives the benefit in relation to its cost. On the cost side, reducing intermediaries reduces costs. On the value side, the easier it is to purchase goods and services using cryptocurrency enhances the perceived value or usefulness of cryptocurrency by potential users. For instance, remittances sent by relatives to their families in emerging markets have traditionally suffered from high costs and have been relatively difficult to initiate or receive. The potential price value improvements offered by cryptocurrency may be substantial due to a combination of lower costs and easier transfer. The more people experience these benefits, the more likely they will realize an enhanced sense of price value and continue cryptocurrency use.

As presented in our results, the findings of this study suggest that the antecedents are widely applicable. Subsequently, the three factors discussed above are applicable across the globe because the country moderators examined in this study do not have significant influence on the model. Thus, stakeholders interested in expanding the use of cryptocurrency can rely upon the steps identified above.

5.4. Limitations and future research directions

Most of these limitations relate to the nature of the current existing empirical literature. The first limitation pertains to the availability of studies included in the analysis. Although the authors conducted an extensive search, there is always a possibility that some of the relevant studies might have been missed and not included. Since cryptocurrency research is in its infancy, there could be studies that have not been published yet or studies that have been conducted but not advanced for publication due to potentially unfavorable results ("file drawer problem"). All of these could have an impact on the overall results. The second limitation has to do with our need for correlational data, which necessarily omitted studies that only reported regression or path coefficients; this was relatively common in our search. While it is always a best practice for empirical studies to report a full correlation matrix, this practice is not being followed by many of the journals that publish research on cryptocurrency usage. Third, all the studies used survey data and likely report inflated correlations due to common method variance. There is no reason to believe that this inflation would be differential in nature and impact the relative importance analysis presented in this research. This inflation, however, could be an issue with the absolute magnitude of correlations and standardized regression coefficients from models we conducted and future research should certainly go beyond single survey, same point in time, collection of the predictor and criterion measures (Podsakoff et al., 2012).

Another limitation is the ability to test moderators from the theoretical models. We were able to examine six relevant moderators. However, due to the limitations of our sample, other moderators that could have been analyzed to provide additional insights on the environmental and situational factors impacting the intention to use cryptocurrency were not available to us. Gender and age were two moderators that we could not test since these variables were not included in the original studies. Furthermore, future studies could examine additional country specific factors like the amount of foreign direct investment received, if the home country currency is pegged to another currency, or if the country from an emerging market is using a currency from the developed country (e.g. Ecuador and Panama using the US dollar) which could influence the various antecedents and the user's intention to use cryptocurrency.

To address some of the limitations identified in this study, we anticipate a significant increase in studies about cryptocurrency and the intention to use it in the near future due to the exponential growth in the usage and the value of cryptocurrencies. This would allow scholars to conduct additional meta-analyses and include additional moderators like time of publication and type of use (currency vs. asset) which can in turn unveil more subtle relationships between certain predictors and the actual intention of cryptocurrency usage.

Moreover, the technology adoption frameworks do not specifically address the nature of technology (i.e., cryptocurrency) and its particularities such as anonymity, potential gain, ease of access, etc. These could be characteristics that future scholars using the technology lens might want to incorporate into their analysis when studying the intention to use cryptocurrency.

In terms of additional future research, this is an area which is truly "wide open" when it comes to further exploration. This study only examined intention to use from the end consumer point of view and did not make a distinction between the classification of the cryptocurrency as an asset or a currency. Future studies could examine the intention to use cryptocurrencies from the merchant point of view (accepting cryptocurrency as a form of payment) and use the two subcategories of asset versus currency to further examine and provide additional insights on the intention to use cryptocurrency. Similar to this end user issue, no integrative research has been conducted focusing on the acceptance of cryptocurrency as a medium of payment. In other words, some preliminary research (e.g., Roos, 2016) has looked at the factors leading to whether businesses will accept cryptocurrency as a form of payment, but this research is relatively new and is still rather small making patterns of meaningful findings difficult to determine. Lastly, there are also potential opportunities to integrate the UTAUT research with the research stream examining the profile and behavior of cryptocurrency users.

Beyond looking at different types of users and different reasons for cryptocurrency use, the consequences of cryptocurrency use need to be much better understood. In other words, as discussed in the introduction and the literature review of this research, there is intense debate regarding whether cryptocurrency is a "pump and dump" scheme, or a useful financial tool that can help increase the pace of development and benefit people in emerging economies. Thus, with time, researchers can look at usage rates and pro versus anti-government policies to see whether these economies are improved, harmed, or not impacted by cryptocurrency. In the end, this is still an unanswered question and one that currently has precious little data to even begin to draw conclusions from.

6. Conclusion

This meta-analytic study provides an integrative look at cryptocurrency use intentions across emerging and developed markets. The goal of the study was to identify the strength of different factors associated with the intention to use cryptocurrency. Further, the study provides an analysis of the consistency of the research findings to better understand whether intention to use cryptocurrency differs across several environmental and situational factors. The results of the meta-analysis are based on 42 studies identifying seven variables and six potential moderators, to better understand the important antecedents of cryptocurrency usage intention. Following the spectrum of theories surrounding the area of technology acceptance, we evaluated the relationship between a total of seven variables with the intention to use cryptocurrency. Our findings, based on the relative importance analysis, indicate that all seven variables played a part in explaining close to 60% of the person's intention to use cryptocurrency, but that a subset of three (attitude toward the behavior, performance expectancy, and price value) have shown themselves to be the most relevant. In fact, the use of these three variables explained 55% of the variance on their own.

In determining whether the relationships of interest were widely influenced by external conditions and situations, our analysis provided six different such moderators. While large number of these moderators were significant via meta-regression techniques, the strength of these moderating relations and their form indicated that while there may be minor differences, that the overall models presented in this paper are relatively robust and that these moderators may not play an important role when it comes to actual implementation of any of the recommendations put forth in this manuscript. This finding suggests that the technology models can be widely applied across markets in various stages of development.

Overall, our findings can serve as guidance for those seeking to drive cryptocurrency demand, to better understand the factors influencing the decision to use cryptocurrency, and to further refine theoretical frameworks for future empirical research. Specifically, these findings can be utilized by policy makers in emerging markets to create conditions for making cryptocurrency use more (or less) likely, and potentially improve financial inclusion. Thus, our study provides a significant contribution to the cryptocurrency usage intention literature, paving the road for future work in this rapidly growing research area.

CRediT authorship contribution statement

William H. Bommer: Conceptualization, Methodology, Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **Emil Milevoj:** Validation, Investigation, Data curation, Writing – original draft, Writing – review & editing. **Shailesh Rana:** Investigation, Data curation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

None.

Appendix A

Table A1
Moderator coding for studies included in the meta-analysis.

Authors	Country/ Region	N	Usage Type	Type	Inno-vation	ATMs[a]	Bank Accounts [b]	Credit Cards[c]
Abbasi et al. (2021)	Malaysia	314	Both	Crypto	100	56.09	85.13	21.31
Abramova and Böhme (2016)	European Union	86	Both	Bitcoin	N/A	73.41 (Euro Area)	N/A	N/A
Ajouz et al. (2020)	Malaysia	92	Both	Crypto	100	56.09	85.13	21.31
Alqaryouti et al. (2019)	UAE	25	Ongoing	Crypto	41.79	60.91	87.39	45.44
Anser et al. (2020)	China	443	Both	Bitcoin	53.28	87.88	80.23	20.82
Arias-Oliva et al. (2019)	Spain	402	New	Crypto	45.6	106.18	93.76	53.88
Bai (2020)	U.S. & China	200	New	Crypto	60.56/ 53.28	93.12 / 87.88	80.23	65.60 / 20.82
Cardoza (2016)	Puerto Rico	237	New	Crypto	N/A	N/A	N/A	N/A
Chan (2019)	Korea	98	New	Crypto	56.11	N/A	94.85	63.66
Chan et al. (2018)	Malaysia	500	Both	Crypto	100	56.09	85.13	21.31
Cheah et al. (2018)	Malaysia	175	Ongoing	Bitcoin	100	56.09	85.13	21.31
Foremar and Löwhagen (2021)	Sweden	70	Both	Bitcoin	62.47	29.62	99.74	44.98
Gil-Cordero et al. (2020)	Spain	327	Ongoing	Crypto	45.6	106.18	93.76	53.88
Gillies et al. (2020)	Malaysia	200	Both	Bitcoin	100	56.09	85.13	21.31
Hobeika and Liew (2018)	France	291	Both	Crypto	53.66	96.24	94.00	40.93
Hoens (2019)	Netherlands	300	Both	Bitcoin	58.76	41.06	99.64	39.10
Ji-Xi et al., 2021	Malaysia	233	Both	Crypto	100	56.09	85.13	21.31
Kim and Choi (2018)	Korea	147	Both	Crypto	56.11	N/A	94.85	63.66
Kim (2021)	United States	395	Both	Bitcoin	60.56	93.12	93.12	65.60
Kim et al. (2018)	Korea	498	Both	Bitcoin	56.11	N/A	94.85	63.66
Lee (2018)	Korea	224	Ongoing	Bitcoin	56.11	N/A	94.85	63.66
Lee et al. (2018)	Korea	192	Both	Bitcoin	56.11	N/A	94.85	63.66
López Zambrano and Camberos Castro (2020)	Mexico	106	Both	Bitcoin	33.6	61.54	35.44	9.53
Lopez-Zambrano et al., 2021	Mexico	174	Ongoing	Bitcoin	33.6	61.54	35.44	9.53
Mahomed (2018)	South Africa	280	New	Crypto	32.67	65.31	67.44	8.87
Mazambani and Mutambara (2020)	South Africa	269	New	Crypto	32.67	65.31	67.44	8.87
Mendoza-Tello et al. (2018)	Spain	125	New	Crypto	45.6	106.18	93.76	53.88
Nadeem et al. (2020)	China	143	Ongoing	Bitcoin	53.28	87.88	80.23	20.82
Nadeem et al. (2021)	China	385	Both	Bitcoin	53.28	87.88	80.23	20.82
Pakrou and Amir (2016)	Iran	62	New	Bitcoin	30.89	N/A	93.36	9.12
Purbandini and Hau (2021)	Indonesia	100	Ongoing	Bitcoin	26.49	53.41	48.39	2.44
Putra and Darma (2019)	Indonesia	98	Ongoing	Bitcoin	26.49	53.41	48.39	2.44
Rodenrijs and Wokke (2018)	European Union	250	New	Crypto	N/A	73.41 (Euro Area)	N/A	N/A
Saif Almuraqab (2020)	UAE	181	Both	Crypto	41.79	60.91	87.39	45.44
Saleh et al. (2020)	Malaysia	306	Both	Crypto	100	56.09	85.13	21.31
Schaupp and Festa (2018)	United States	117	New	Crypto	60.56	N/A	93.12	65.60
Shahzad et al. (2018)	China	376	Both	Bitcoin	53.28	87.88	80.23	20.82
Siquian (2020)	United States	163	Both	Bitcoin	60.56	N/A	93.12	65.60
Sohaib et al. (2019)	Australia	140	Both	Crypto	48.35	129.69	99.52	59.69
Sombero (2019)	Philippines	110	Ongoing	Bitcoin	35.19	29.72	31.80	1.94
Sun et al. (2020)	Korea & China	244	New	Crypto	56.11/ 53.28	N/A / 87.88	94.85 / 80.23	63.66 / 20.82
Voskobojnikov et al. (2021)	United States	404	Both	Crypto	60.56	N/A	93.12	65.60

[a] ATMs per 100,000 adults, 2020 - Country rankings: The average for 2020 based on 110 countries was 61.39 ATMs per 100,000 adults. The highest value was in Macao: 321.33 ATMs per 100,000 adults and the lowest value was in Guinea: 2.54 ATMs per 100,000 adults. The indicator is available from 2004 to 2020. Below is a chart for all countries where data are available. Measure: ATMs per 100,000 adults; Source: The World Bank.

[b] People with bank accounts, percent of the population over 14 years of age, 2017 - Country rankings: The average for 2017 based on 142 countries was 58.52%. The highest value was in Denmark: 99.92% and the lowest value was in Chad: 8.75%. The indicator is available from 2011 to 2017. Below is a chart for all countries where data are available. Measure: percent; Source: The World Bank.

[c] Percent of people aged 15+ who have a credit card, 2017 - Country rankings: The average for 2017 based on 142 countries was 19.28%. The highest value was in Canada: 82.58% and the lowest value was in Turkmenistan: 0%. The indicator is available from 2011 to 2017. Below is a chart for all countries where data are available. Measure: percent; Source: The World Bank.

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